Massachusetts Bays
NATIONAL ESTUARY PROGRAM

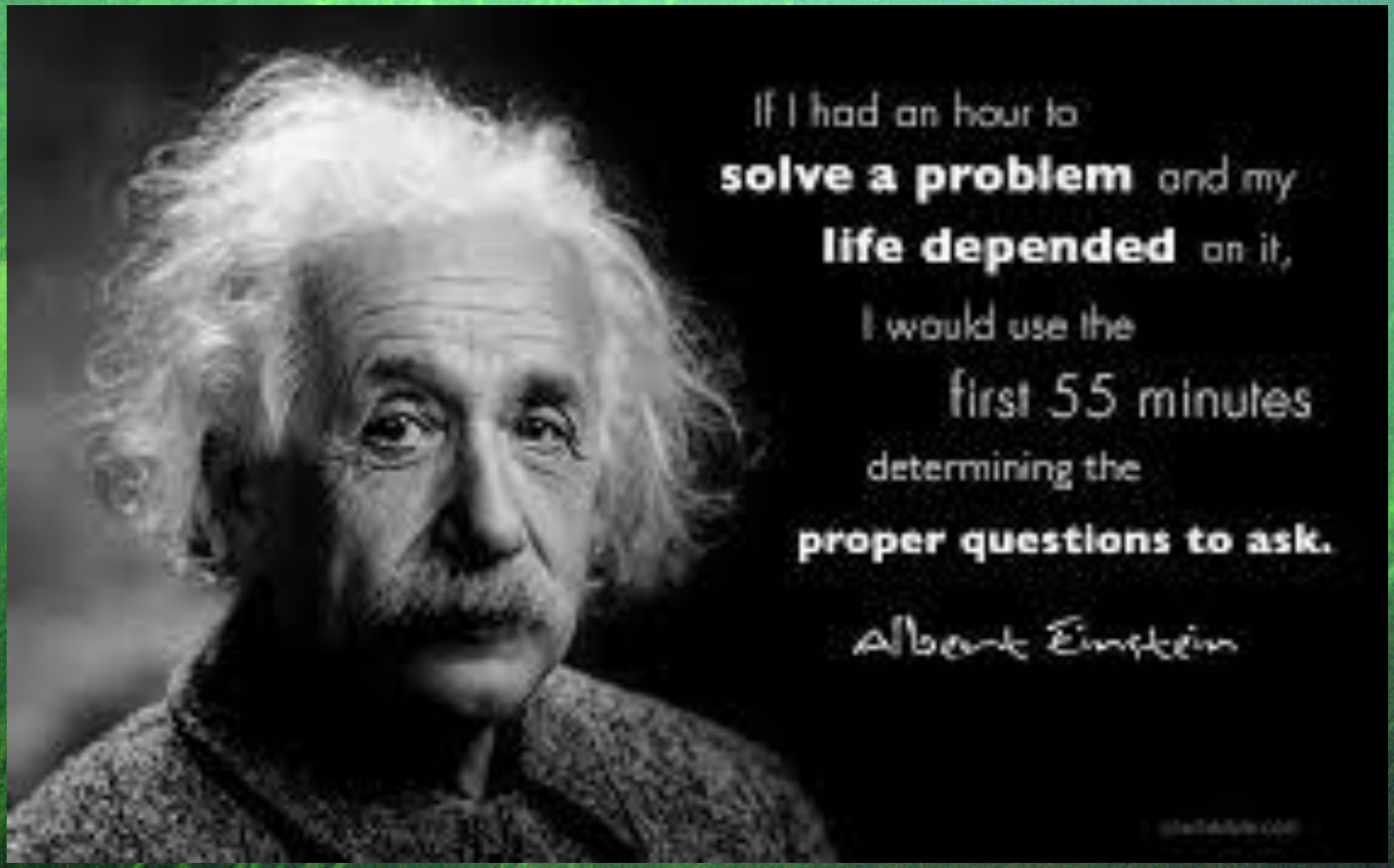
Citizen Monitoring Coordinators' Summit

September 29, 2016
Massachusetts Division of Fisheries and Wildlife Field Headquarters
1 Rabbit Hill Road Westborough, MA 01581

Asking the Big Questions:

National Estuary Programs
and
People-Powered Science

Asking the Big Questions



Asking the Big Questions

Science

Society

Economy

CCMPs

Annual Workplans

GPRA Measures

Tangible Results

Asking the Big Questions

What Is The NEP Approach?

- Establish a governance structure
- Involve community stakeholders as equal partners
- Engage the public throughout the decision-making process
- Collaborate to identify problems and solutions
- Build on water quality control measures and tailor them to specific places
- Set measurable goals and objectives and monitor effectiveness of actions – adjust if necessary
- Develop and implement a Comprehensive Conservation Management Plan (CCMP)

Asking the Big Questions

What Is An NEP Management Conference?

- A collection of stakeholders, organized to facilitate collaboration, consensus-building, and public input.
- Representatives from Federal, state and local governments, nonprofit organizations, affected business and industries, academia, and the general public. EPA is a participant and provides management guidance, along with financial and technical assistance.
- Together the group works to articulate common goals and take action to address a wide range of issues in their CCMP.

Asking the Big Questions

What Does An NEP Management Conference Do?

- Develop a comprehensive plan to restore and maintain the chemical, physical, and biological integrity of the estuary, including restoration and maintenance of water quality, a balanced indigenous population of shellfish, fish and wildlife, and recreational activities in the estuary, and assure that the designated uses of the estuary are protected;

- Develop plans for the coordinated implementation of the plan;

Asking the Big Questions

What Does An NEP Management Conference Do?

- assess trends in water quality, natural resources, and uses of the estuary;
- collect, characterize, and assess data to identify the causes of environmental problems;
- develop the relationship between pollutants and potential uses, water quality, and natural resources;
- monitor the effectiveness of actions

Asking the Big Questions

Why Does an NEP Monitor?

- To create data to assess the scale of a problem, enable mapping, predictability, better understanding of causes and impacts, and to compare results from different monitoring approaches; and

- To raise awareness in the public about a problem and the role they can play in recognizing sources and advocating for improvement .

Asking the Big Questions

How Does an NEP Monitor?

By providing:

- capacity to determine the potential and actual effects of alternative management strategies and measures;
- assistance in the development of baseline studies and predictive models;
- ecosystem assessment to determine the state of estuarine zones and the effects of natural and anthropogenic changes;

Asking the Big Questions

But working with volunteers and "non-scientists" requires a major mind shift

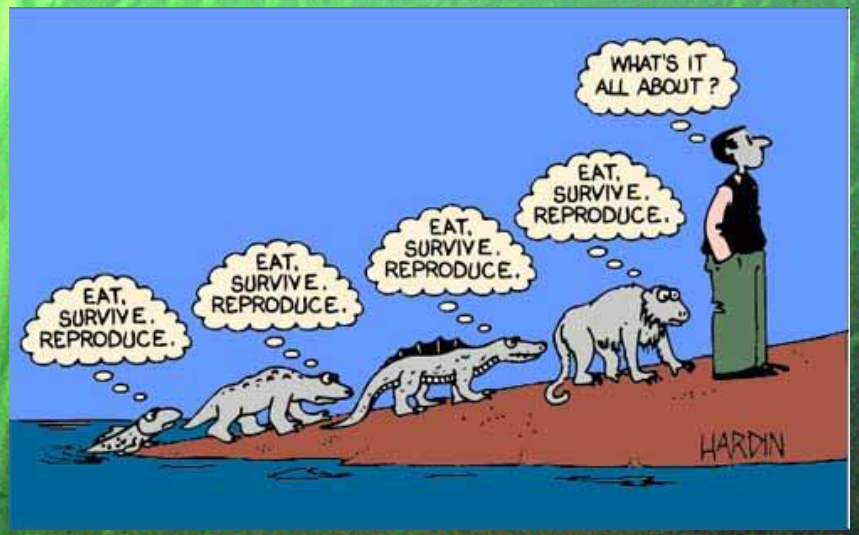
TECHNICAL PROBLEM SOLVING to ***ADAPTIVE*** **SOLUTIONS**

Asking the Big Questions

CHECKING A QAPP BOX

to

INQUIRY BASED INVESTIGATIONS



Asking the Big Questions

- Citizen monitoring and citizen science are powerful tools for public involvement and collective impact
- They give people a major role in protecting their communities and setting priorities
- Public health and environmental programs need them and their organizations to play a key part
- We need to make it easier for them to participate

Asking the Big Questions

Introduction to the Bays, and the MassBays Monitoring Framework

Overview

About the Bays

- Physical setting and biodiversity

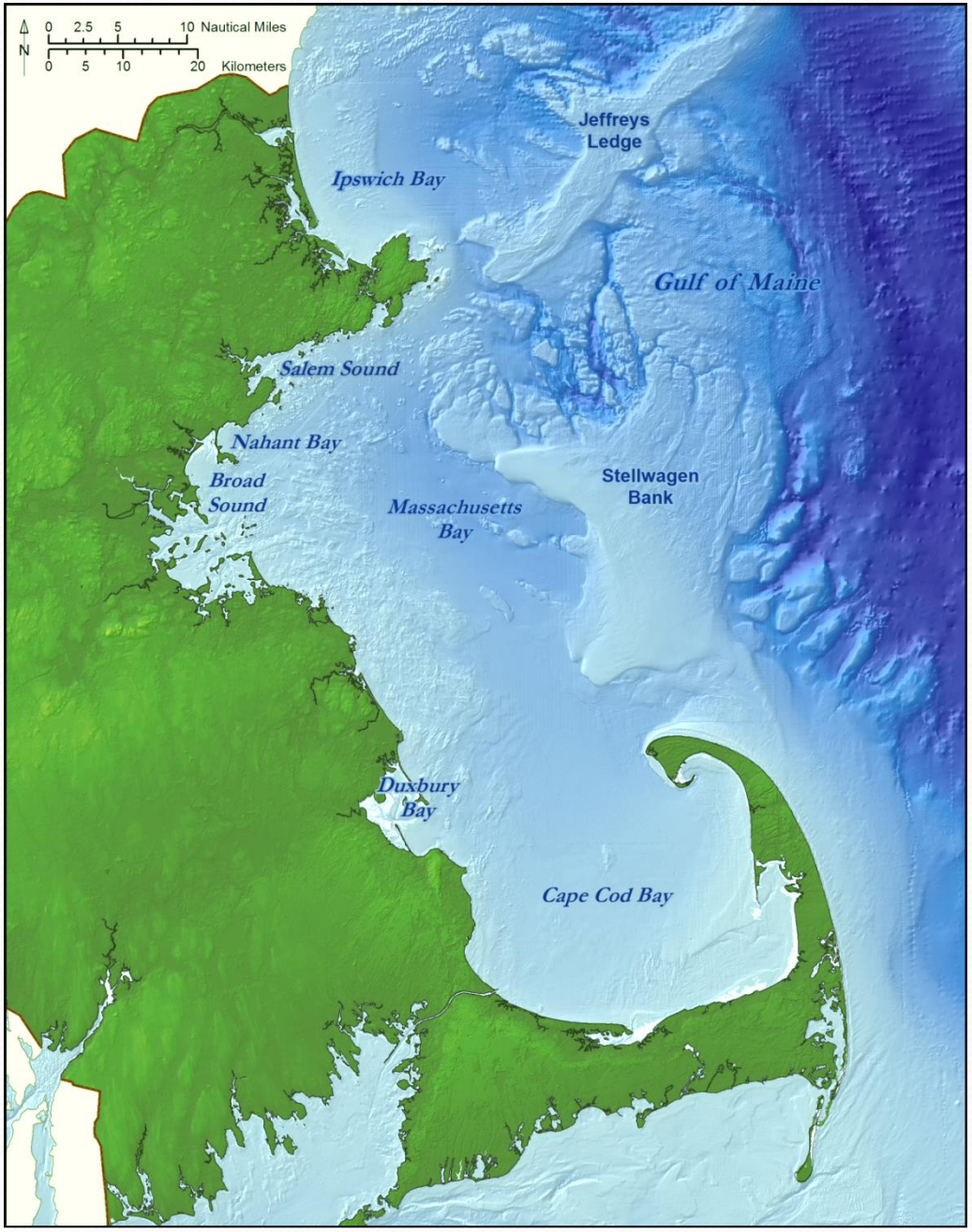
…and their Communities

- Population and the economy
- Human uses, and impacts

Assessing changing conditions across the Bays

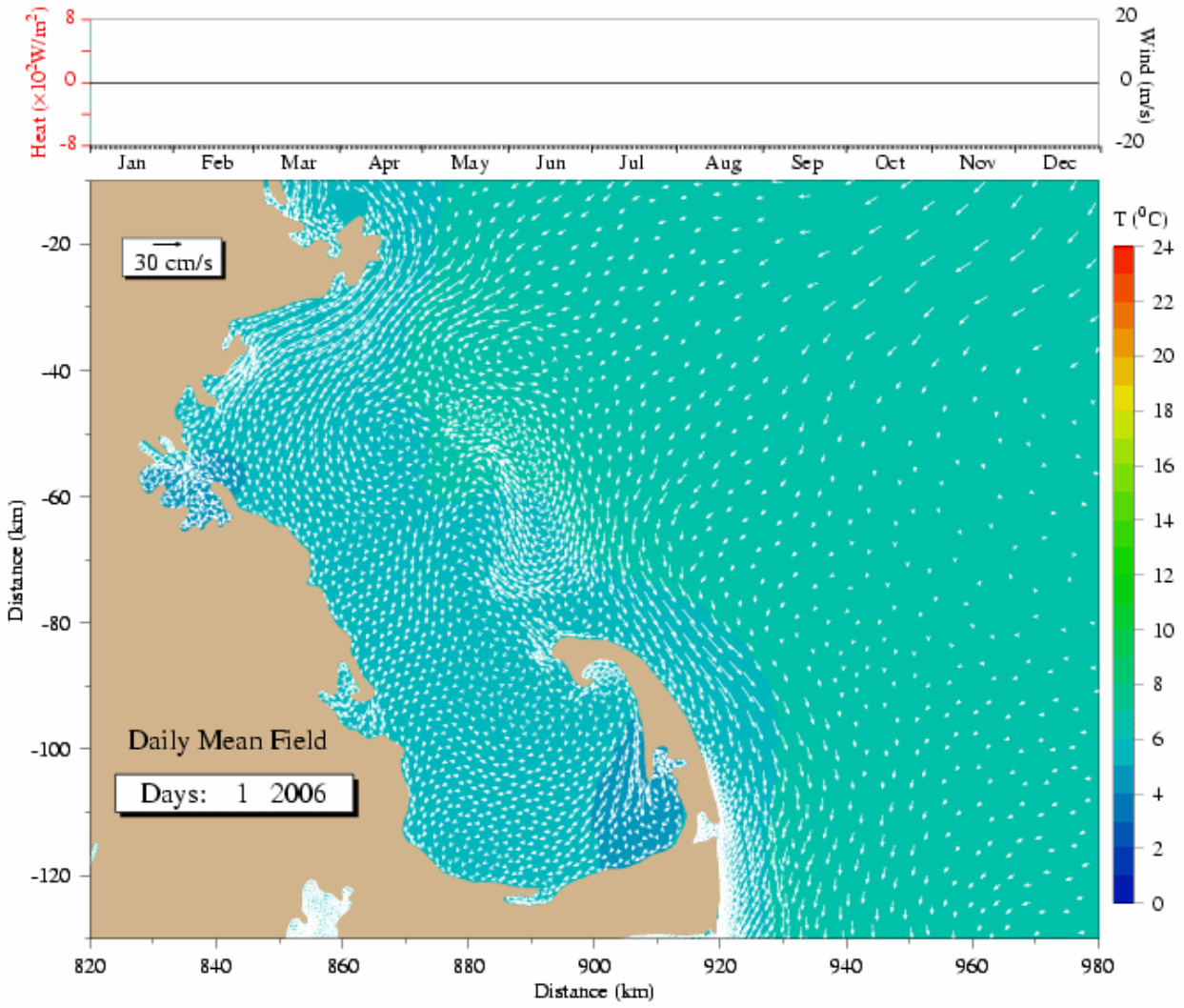
- Characterizing estuarine embayments
- A Monitoring Framework for MassBays
- State of the Bays reporting

About the Bays

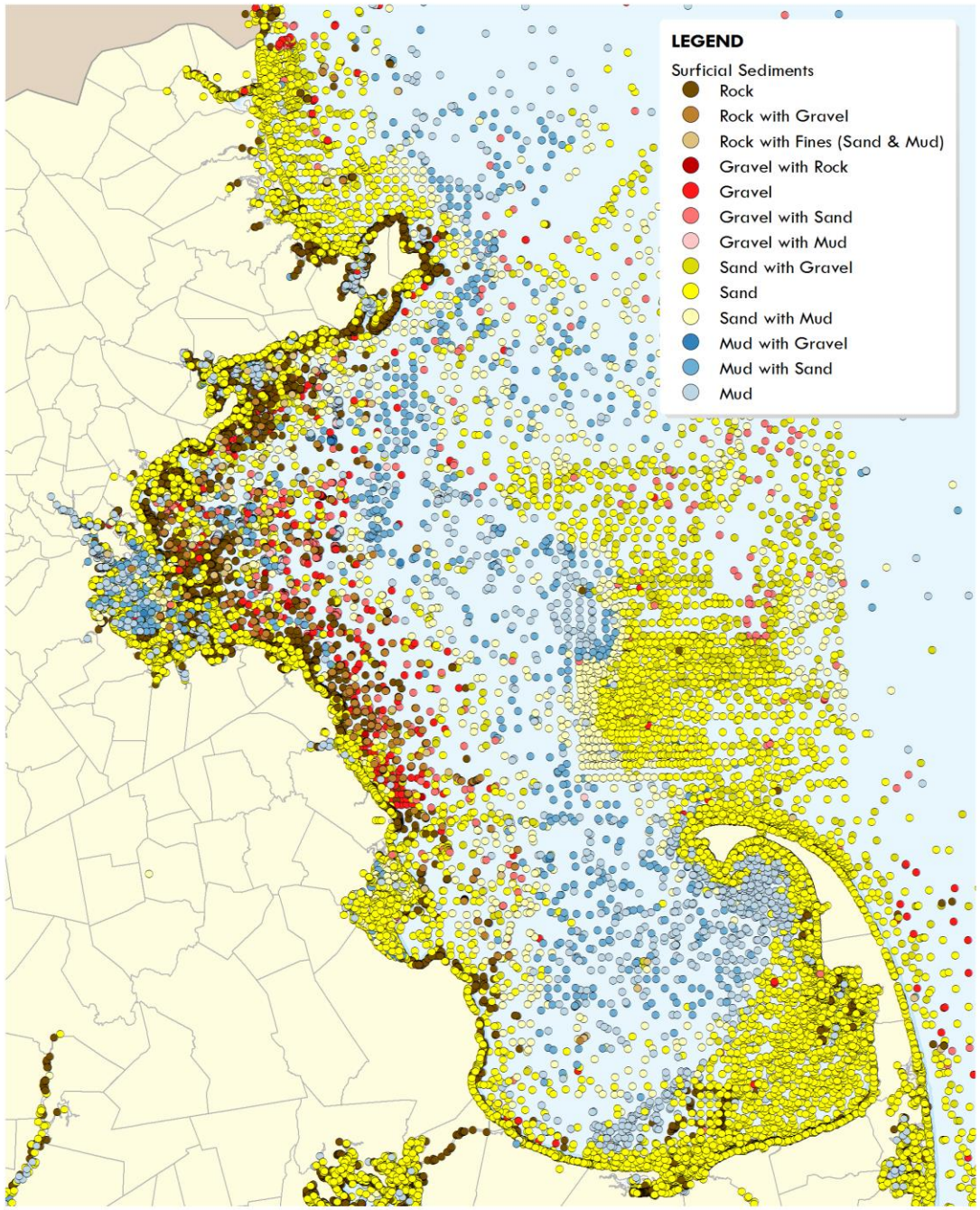


- The MassBays NEP comprises:
  - Ipswich Bay + Upper North Shore
  - Massachusetts Bay
  - Cape Cod Bay
- 1100 miles from Salisbury to Provincetown
- Outer edge defined by Stellwagen Bank
- 50 communities across urban, suburban, and rural settings

Water Temperature and Currents



Finite-Volume Coastal Ocean Model (Chen et al.)



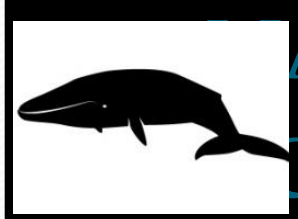
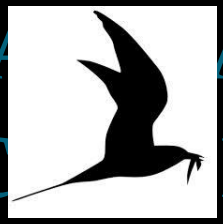
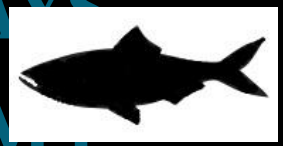
0 Nautical Miles 8

0 Kilometers 15

Data sources: Massachusetts Department of Environmental Protection, Massachusetts Division of Marine Fisheries, Massachusetts Office of Coastal Zone Management, National Oceanic & Atmospheric Administration, U.S. Geological Survey

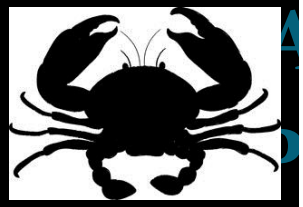
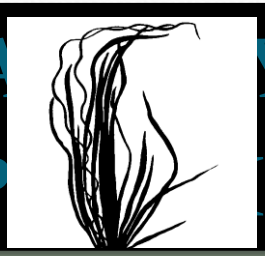
Map coordinate system: North American Datum of 1983, Massachusetts State Plane Coordinate System, Mainland Zone (FIPS zone 2001), meters

MassBays marine life and habitats

- **Phytoplankton = 302 sp**
- **Algae = 431 sp**
- **Invertebrates = 1721 sp**
- **Crabs & Shrimp = 16 sp**
- **Fish = 467 sp**
- **Birds = 176 sp**
- **Mammals = 29 sp**

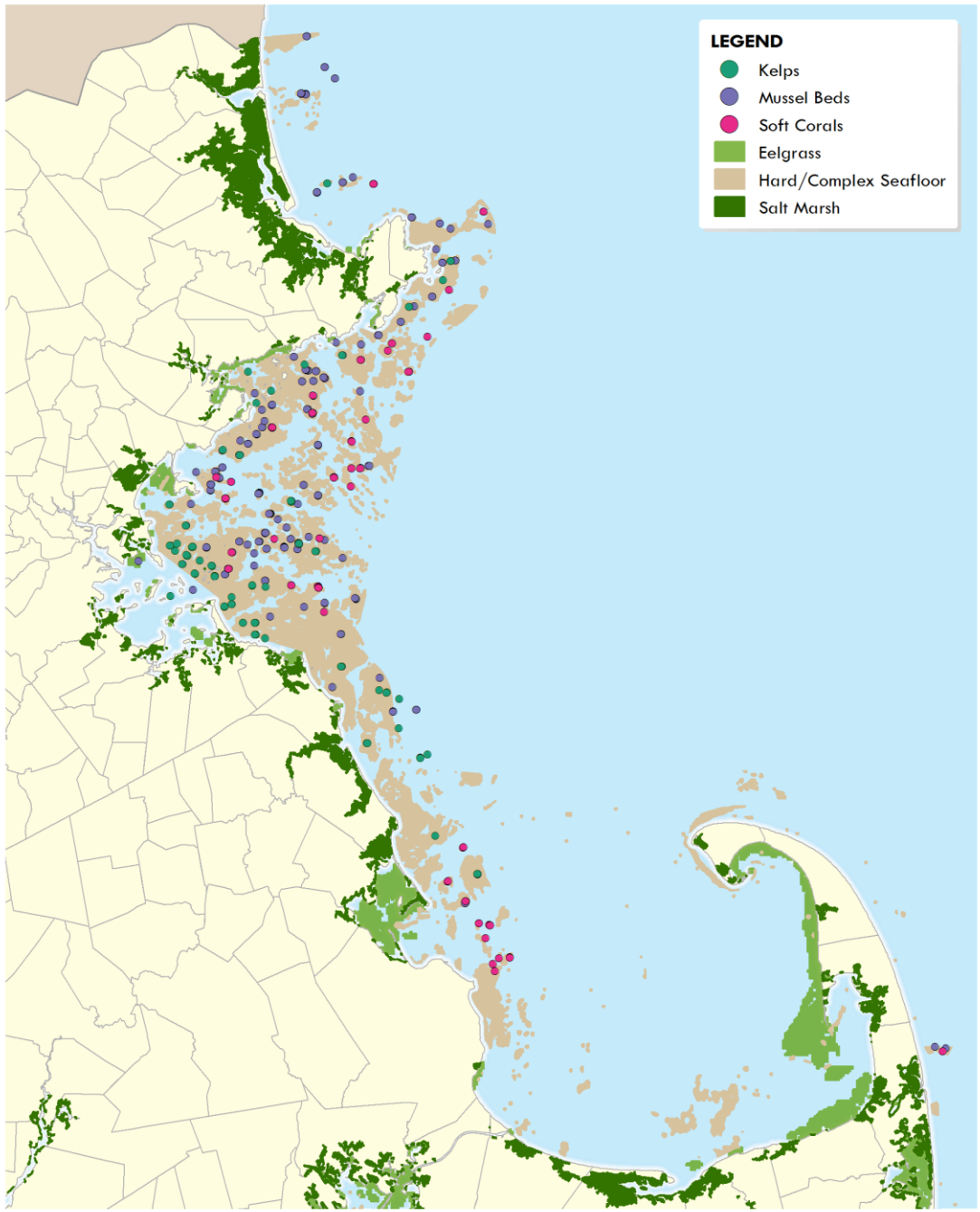
Sources: Census of Marine Life, Gulf of Maine Register


Important Habitat Areas:

- **Upwelling and fronts**
- **Biogenic habitats: eelgrass, kelp, corals, shellfish/invert reefs**
- **Abiotic structure: hard and complex seafloor**
- **Salt marsh**
- **Mudflats**

Source: MA Ocean Plan Baseline Assessment 2015


LEGEND
Kelps
Mussel Beds
Soft Corals
Eelgrass
Hard/Complex Seafloor
Salt Marsh
0 Nautical Miles 8
0 Kilometers 15
Data sources: MA Board of Underwater Archaeological Resources, MA Department of Environmental Protection, MA Division of Marine Fisheries, MA Office of Coastal Zone Management, National Oceanic & Atmospheric Administration, U.S. Geological Survey
Map coordinate system: North American Datum of 1983, Massachusetts State Plane Coordinate System, Mainland Zone (FIPS zone 2001), meters

…and their communities

Marine Economy

Massachusetts GDP:

- 2000 = $350.2 M
- 2013 = $420.8 M

Mass Bays coastal counties GDP:

- 2000 = $276.8 M
- 2013 = $333.9 M

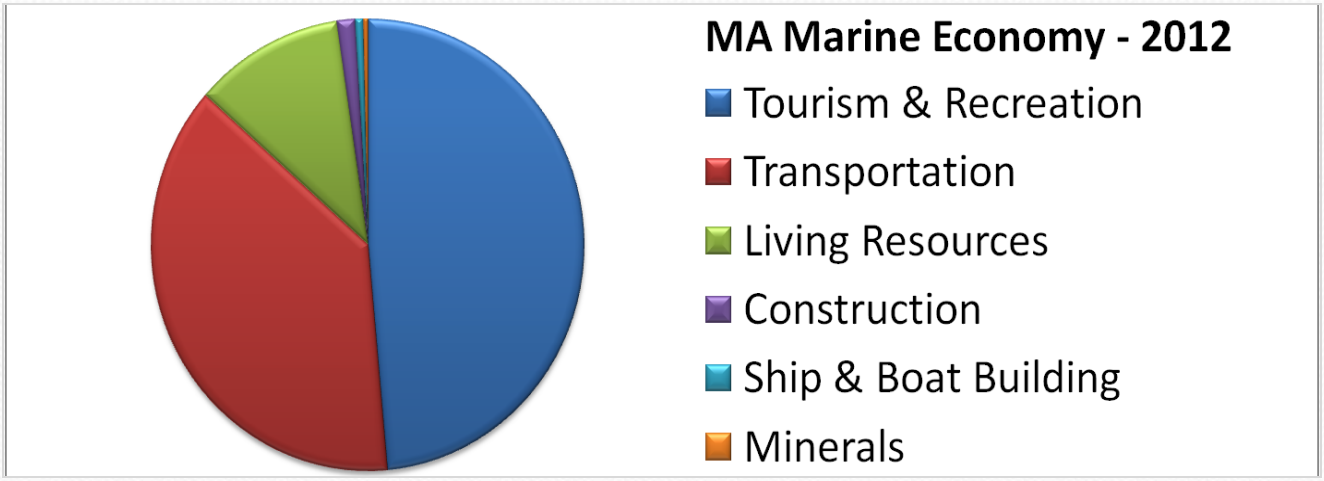
Massachusetts:

- 2000 = 6.36 M
- 2013 = 6.71 M

Mass Bays coastal counties:

- 2000 = 4.22 M
- 2013 = 4.49 M

Source: U.S. Census Bureau

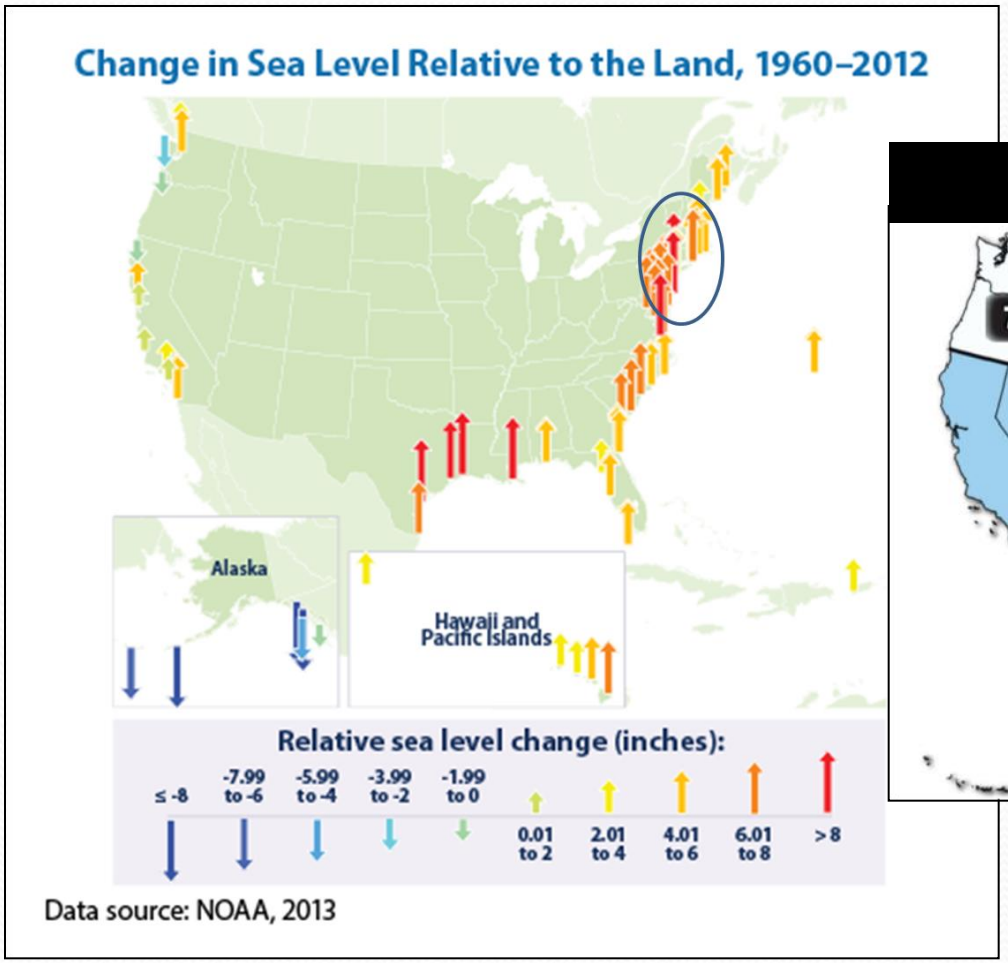


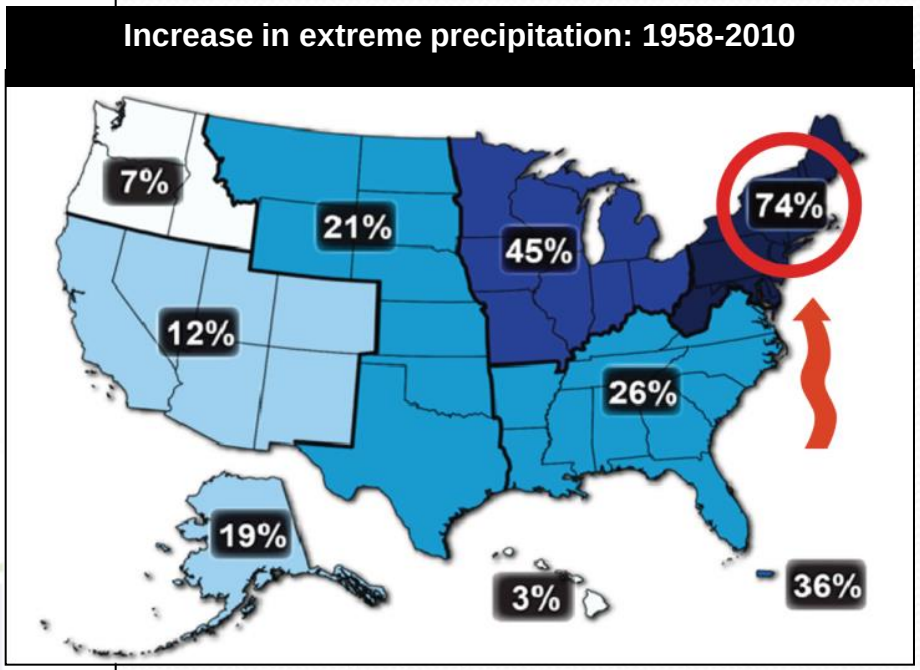
Source: National Ocean Economics Program (2009 dollars), www.oceaneconomics.org

Coastal and marine uses

- Fishing
- Recreational
- Maritime transportation
- Energy
- Infrastructure
- Ocean disposal
- Shoreline protection
- Offshore sand for beach nourishment
- Research & education
- Archaeological & cultural heritage
- Military training, defense, & law enforcement
- Protected areas

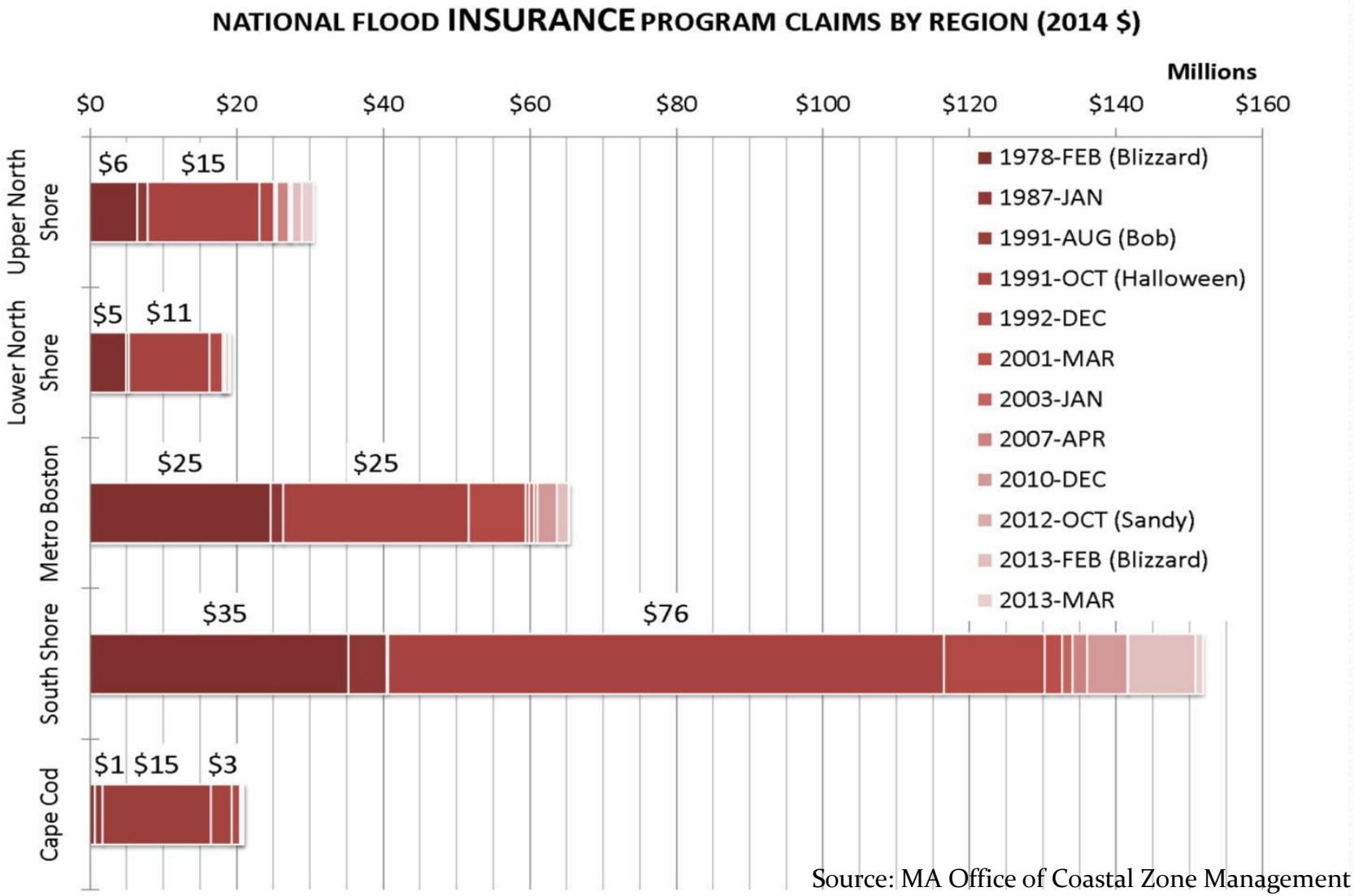
Climate change impacts





Source: National Weather Service

Coastal Storms and Flooding

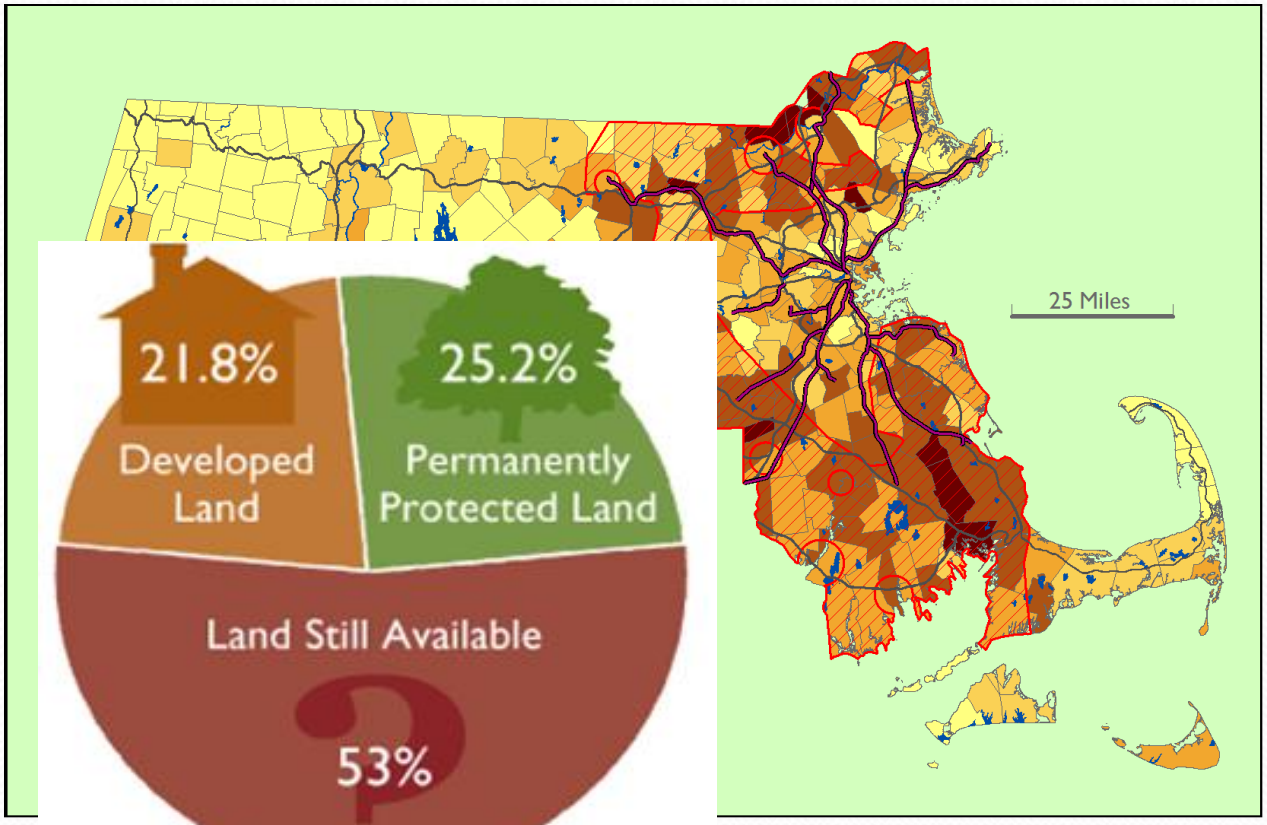


Source: MA Office of Coastal Zone Management

Population & Land Development

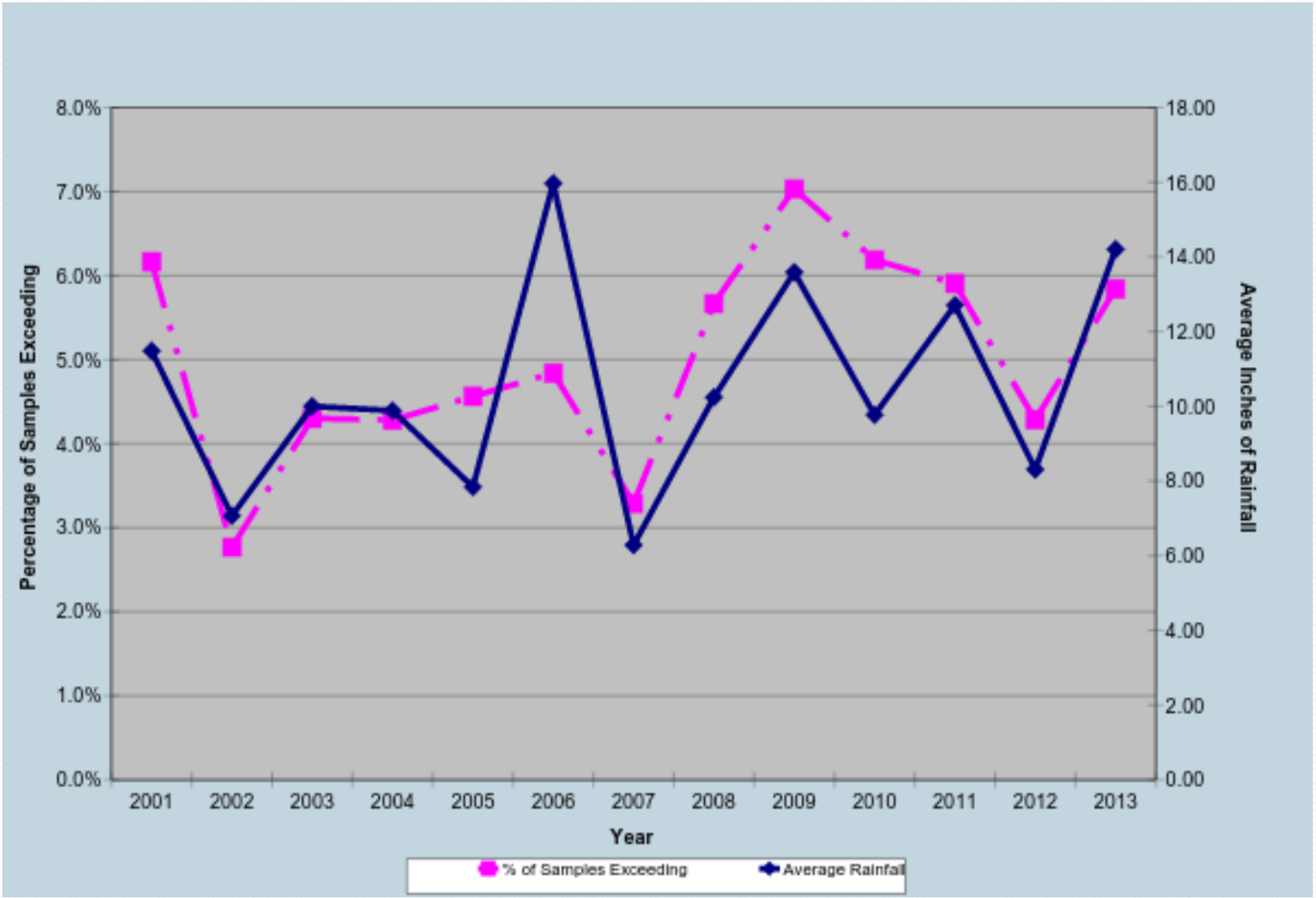
Population within MassBays' 50 communities: 1.7 million

Development change, 2005 - 2013



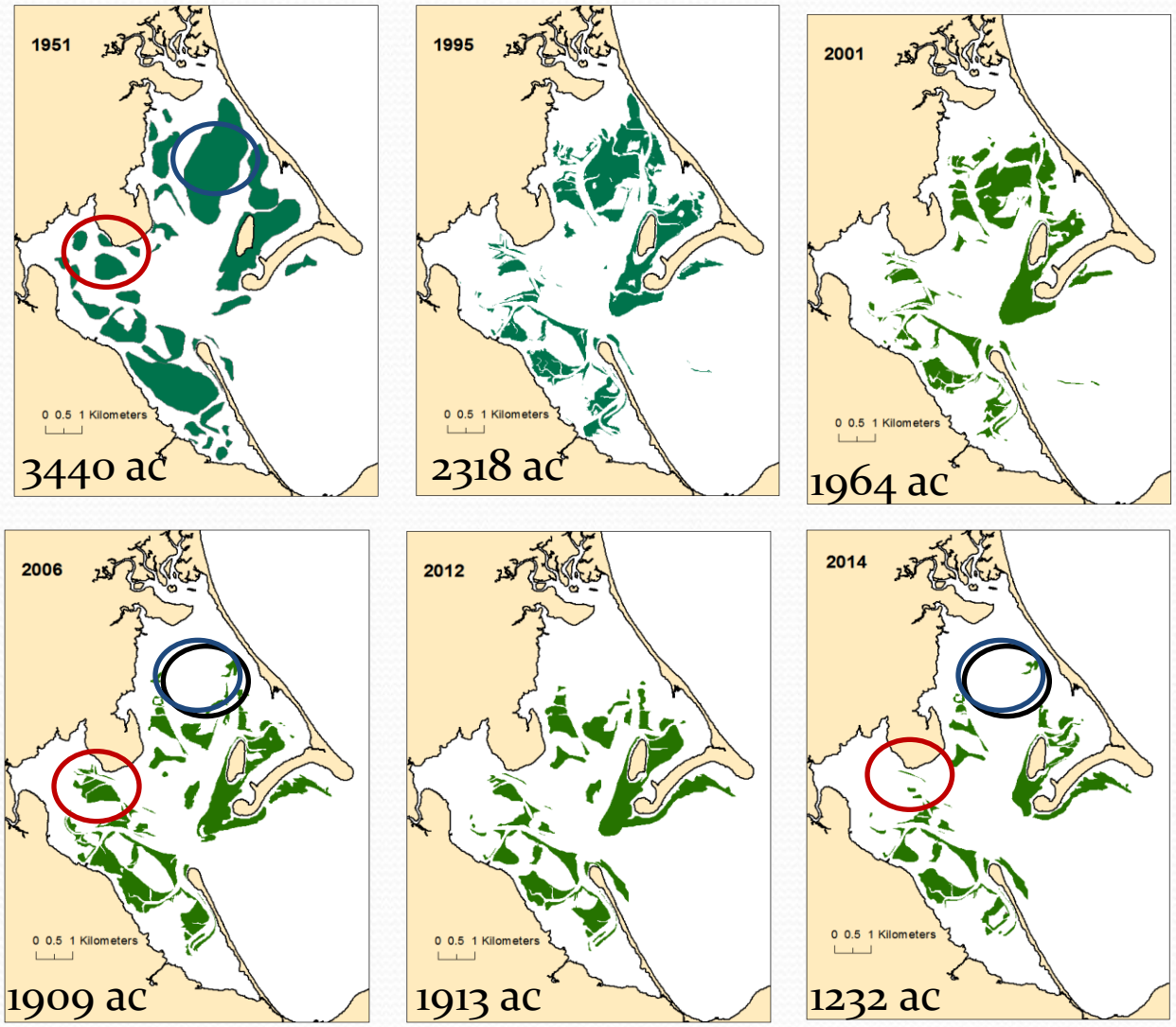
Source: Mass Audubon

Marine Beach Standard Exceedances



Source: MA Department of Public Health

Eelgrass

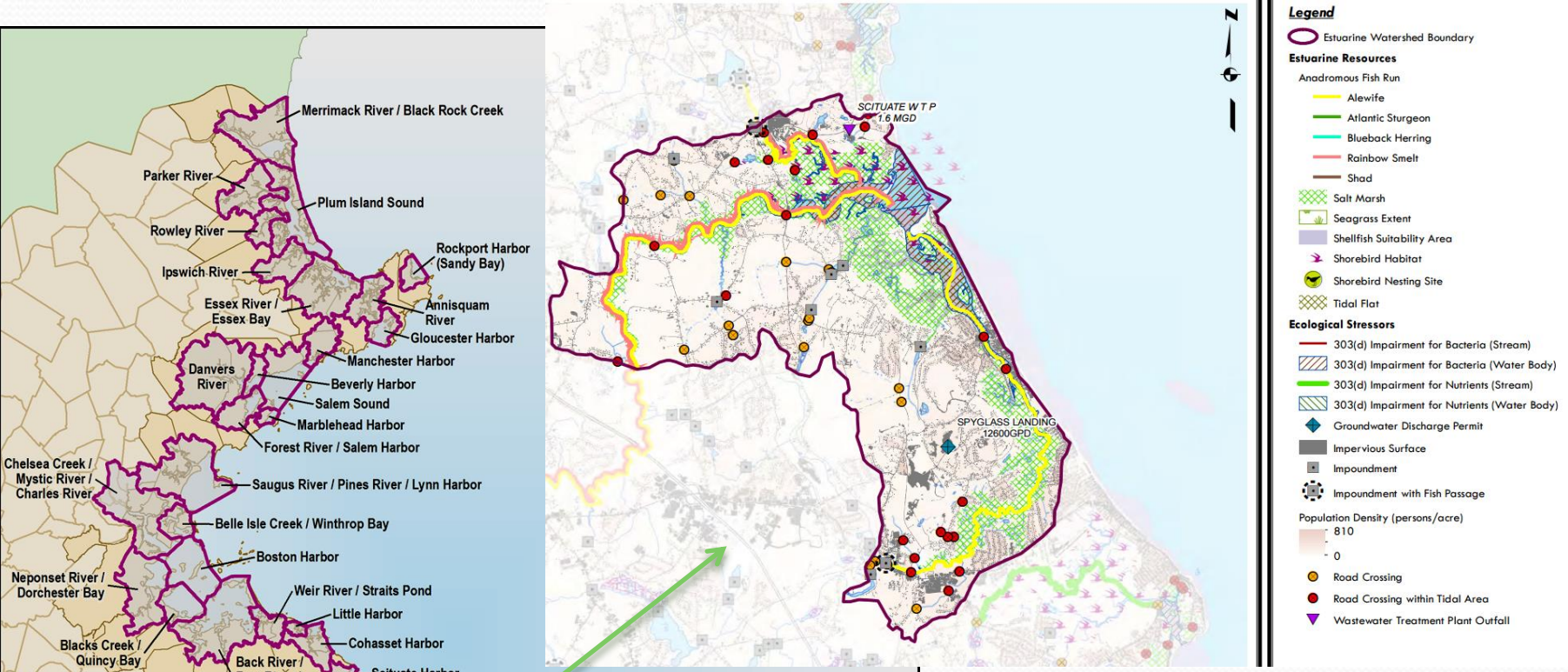


2,000 acres lost since 1951 (-64%).

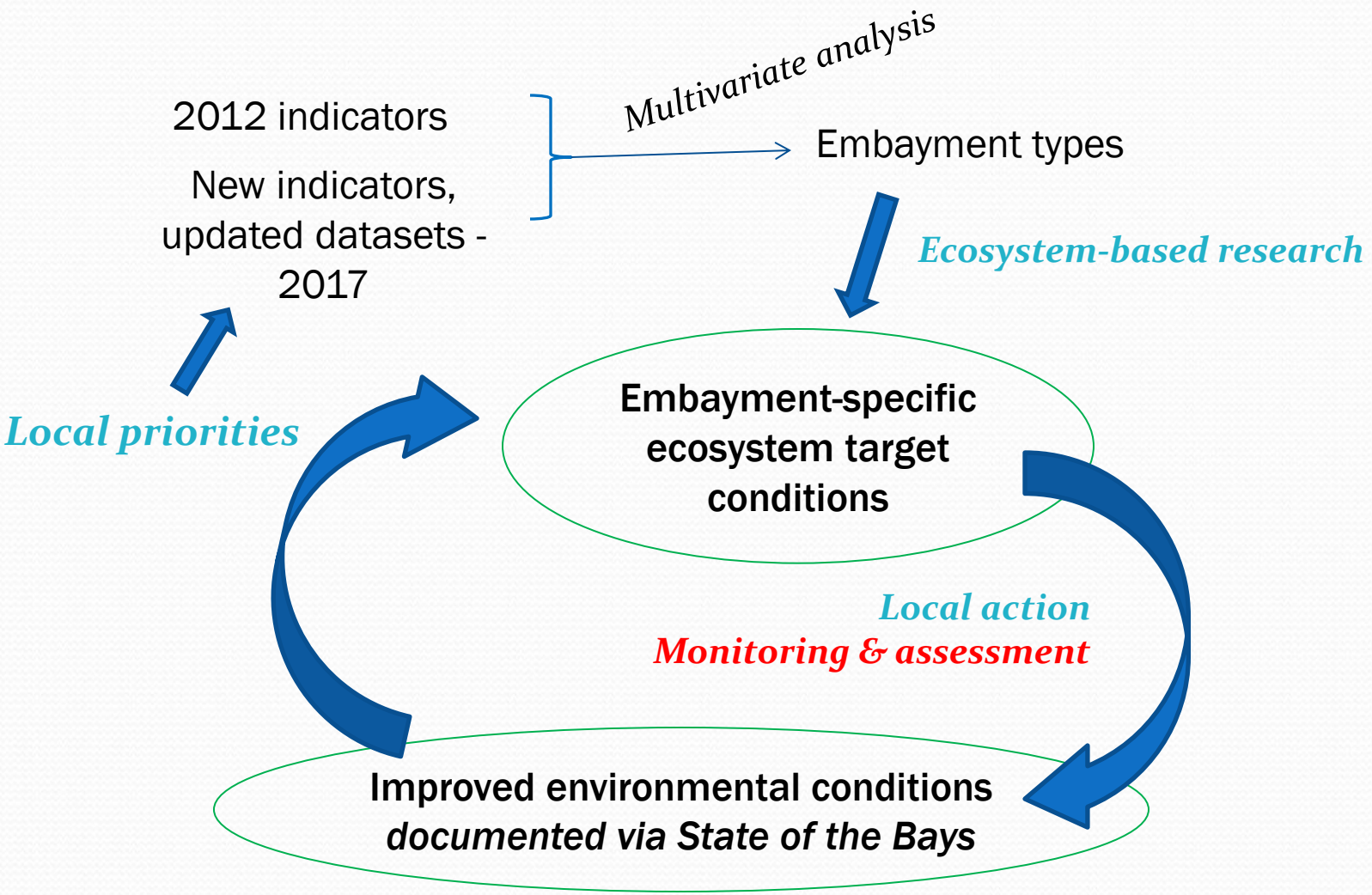
700 acres lost since 2012 (-36%).

Source: MA Division of Marine Fisheries, MA Department of Environmental Protection

Assessing conditions in the Bays



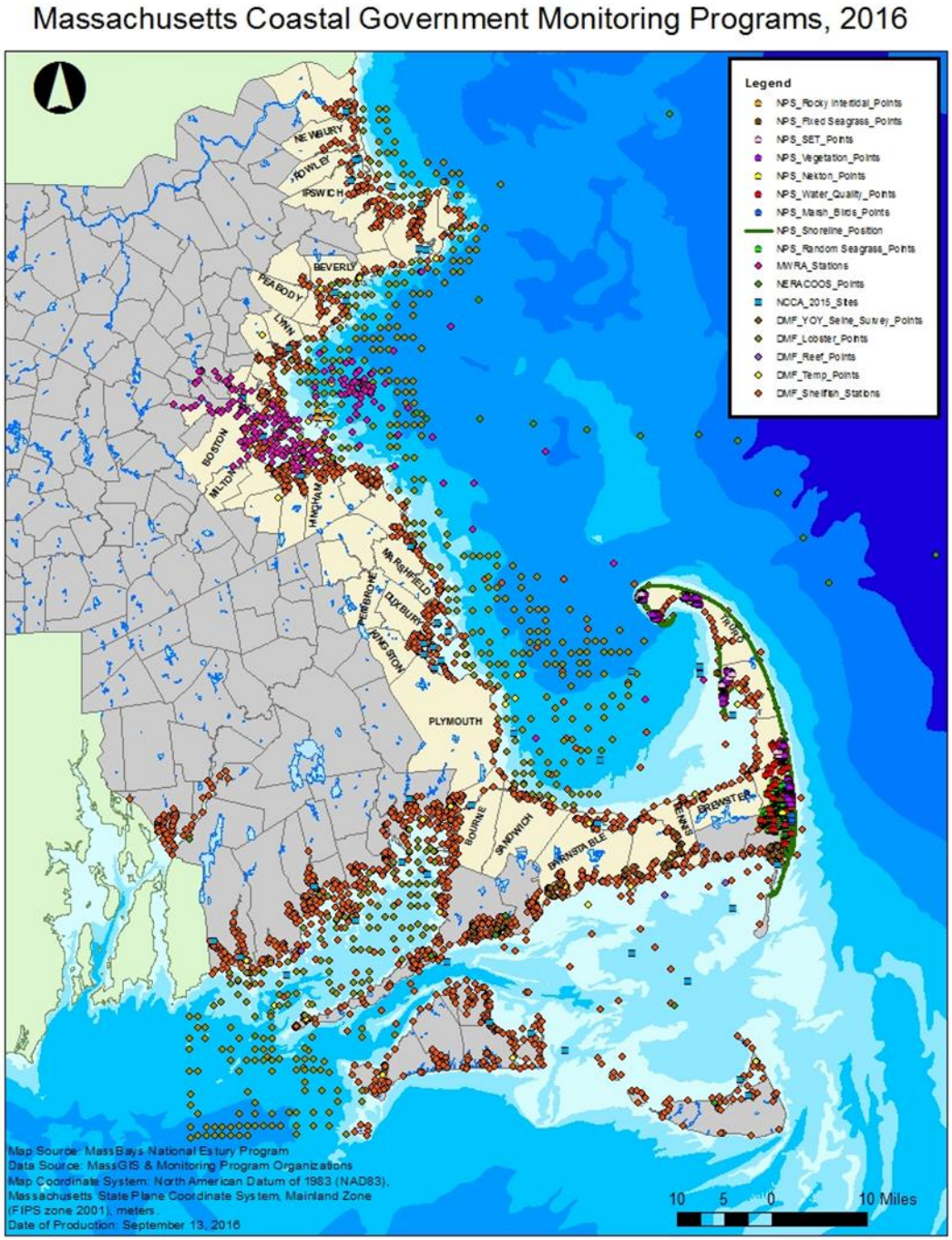
- 47 embayments delineated through Estuary Delineation & Assessment (2012)
- Landward and seaward boundaries
- Identified resources stressors


2012 indicators
New indicators, updated datasets - 2017
Multivariate analysis
Embayment types
Ecosystem-based research
Local priorities
Embayment-specific ecosystem target conditions
Local action
Monitoring & assessment
Improved environmental conditions documented via State of the Bays

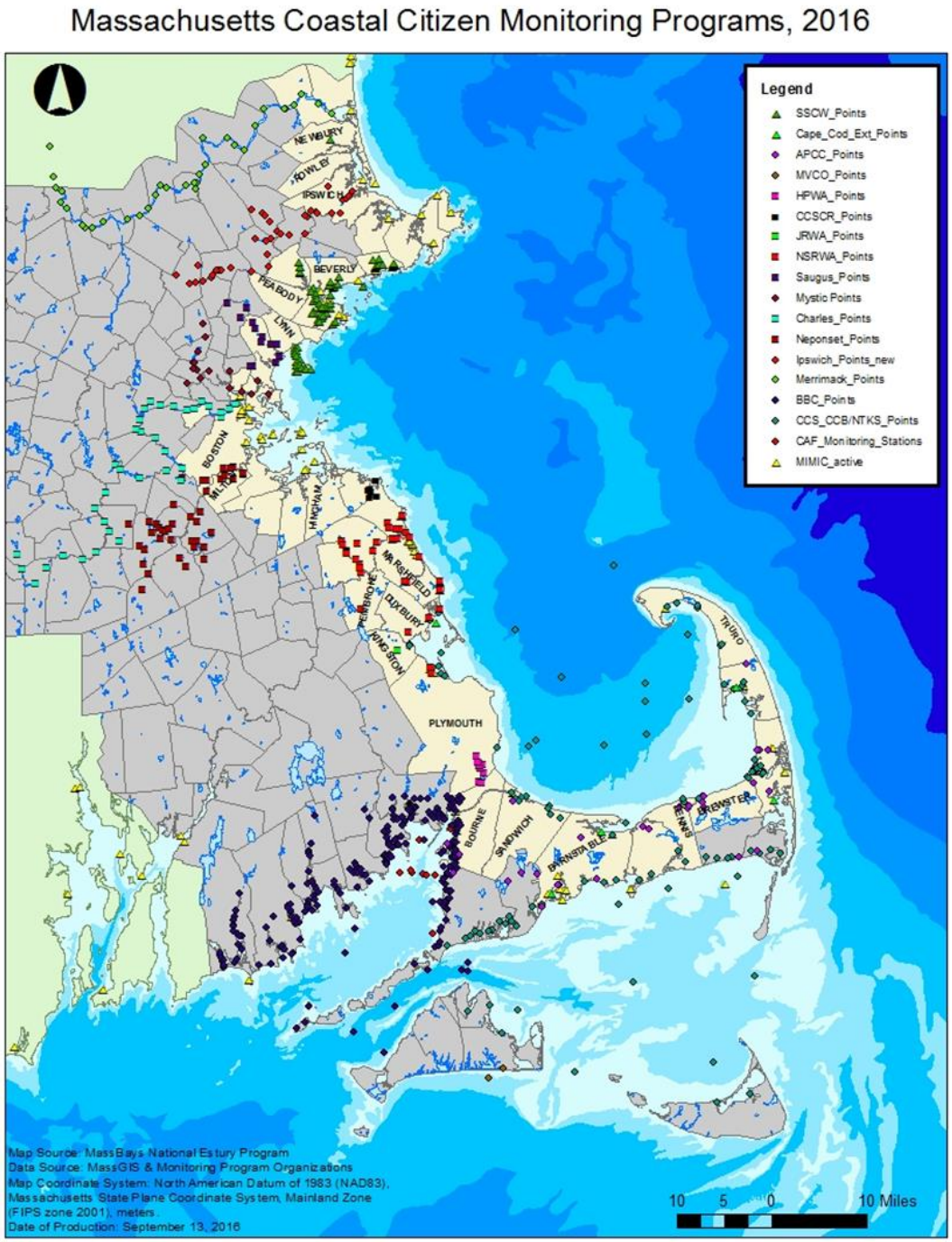
Developing a monitoring framework

1. Conduct an inventory of programs

- Developed a comprehensive inventory of monitoring programs in MassBays
- Used existing datasets and outreach to identify groups and programs
- Focused on water quality, sediment, or species specific coastal and watershed monitoring programs
- Online survey
- Station location coordinates



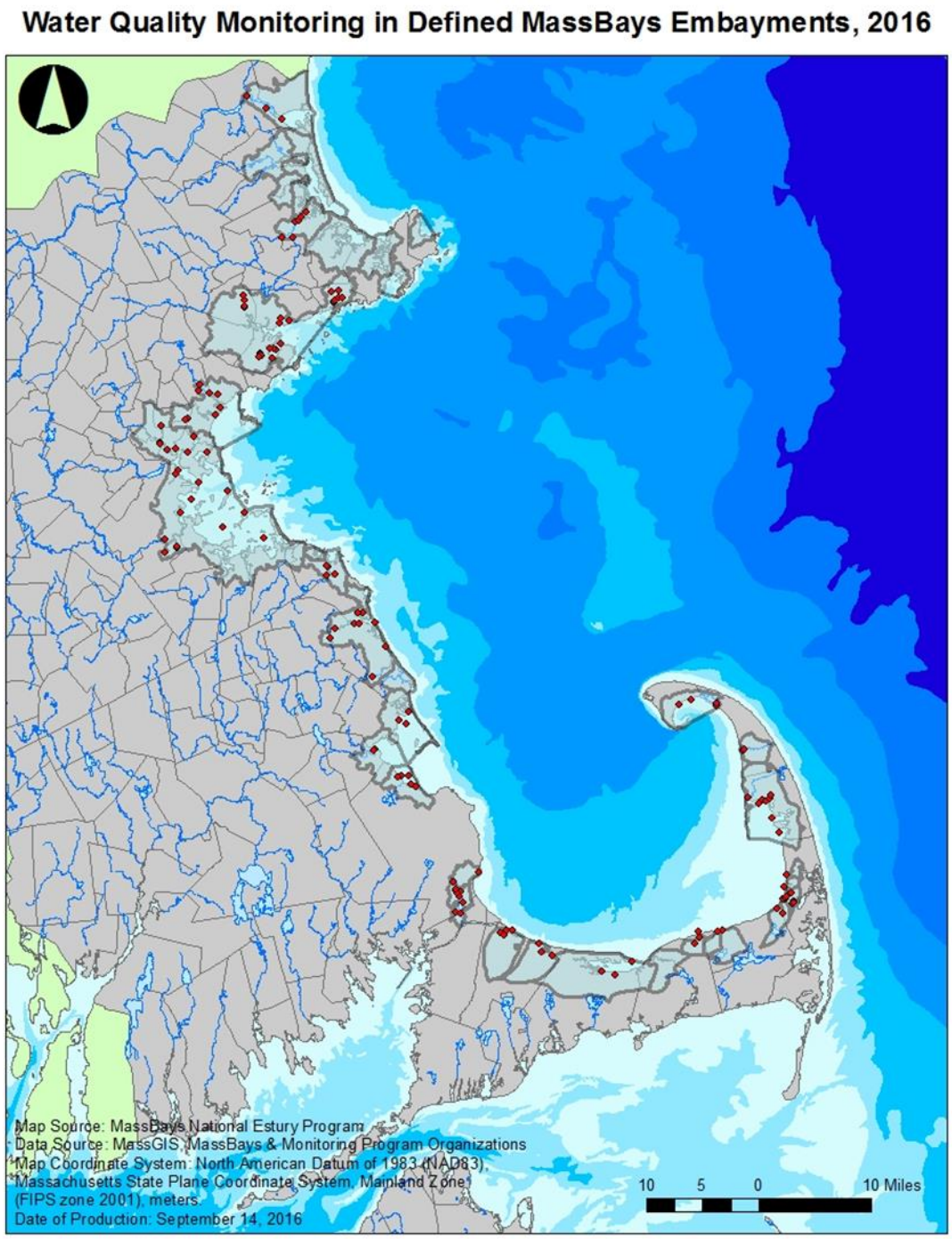
- 22 government run monitoring programs
- 16 (72%) of those programs responded to the survey and provided station coordinates



- We have identified 69 citizen monitoring programs
- 60 (87%) of those programs provided detailed information on the program and station locations

2. Conduct a gap assessment

- Need to assess what is being measured, when and where
- The data were split into 10 categories
- The data points were overlayed with the embayments to identify what monitoring is occurring in each embayment
- Started to incorporate location of major stressors



- We identified 21 programs that monitor water quality
- Sampling points are located in most of the embayments
- Program objectives vary depending on the questions are asked
- Data sets have varied time frames, parameter sets, spatial extents, field collection and analytical methods etc.

Next steps

- Finish compiling monitoring program info includes: monitoring objective, habitat type and parameters, spatial info, data management & sharing, and QA/QC.
- Reviewed by STAC and a dedicated work group
- Presented to EPA in spring 2017
- Used as the main information tool for our state of the bays reporting
- Exploring how we can work together with you to make this possible

MassBays' Investment in Citizen Monitoring

Massachusetts is ahead of the tide

- Woburn drinking water monitoring, 1970s
- Westport Riverwatch, 1991
- Massachusetts Watershed Initiative, 1994

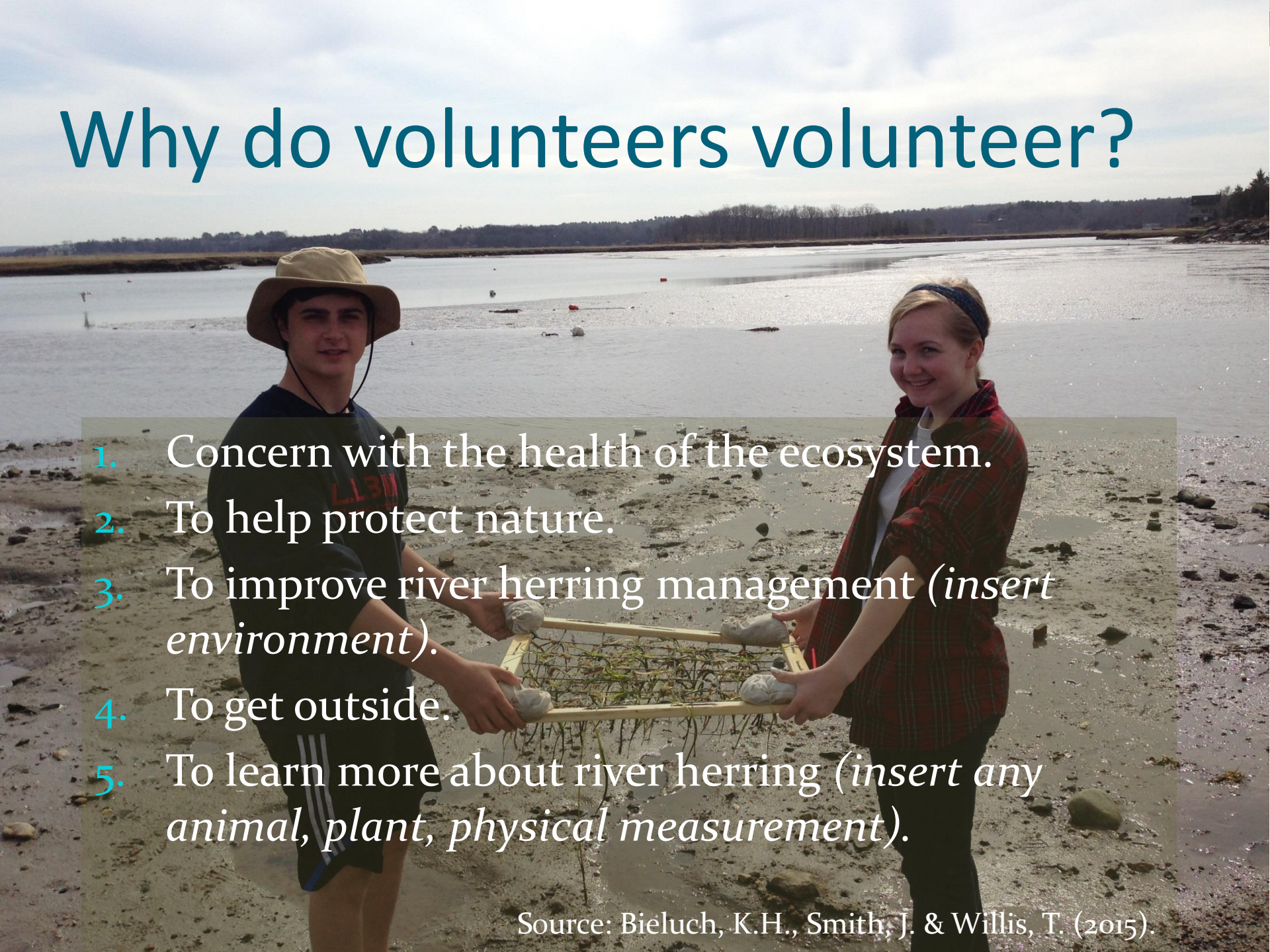
…

- National Citizen Science Association formed, 2013
- President's Summit, 2015
- *Citizen Science: Theory and Practice* launched, 2016

Why do you do what you do?

- Engage volunteers and partners in stewardship
- Document problems, measure progress
- Prompt action
- Educate the larger community
- Learn about local natural systems
- Contribute to scientific knowledge
- …??

Why do volunteers volunteer?



1. Concern with the health of the ecosystem.
2. To help protect nature.
3. To improve river herring management *(insert environment).*
4. To get outside.
5. To learn more about river herring *(insert any animal, plant, physical measurement).*

Source: Bieluch, K.H., Smith, J. & Willis, T. (2015).

Why is MassBays getting involved?

1. Meet Clean Water Act §320 mandates

- *assess trends* in water quality, natural resources, and uses of the estuary;
- *collect, characterize, and assess data* on toxics, nutrients, and natural resources within the estuarine zone to identify the causes of environmental problems;
- develop the relationship between the inplace loads and point and nonpoint loadings of *pollutants to the estuarine zone and the potential uses* of the zone, water quality, and natural resources…
- *monitor the effectiveness* of actions taken…

2. Fulfill MassBays' Vision &Mission

We envision a ***network of healthy and resilient estuaries***, sustainable ecosystems that support the life and communities dependent upon them.

MassBays is dedicated to protecting, restoring, and enhancing the estuarine ecosystems of Massachusetts Bay and Cape Cod Bay. ***We facilitate partnerships*** to prompt local, state, and federal action and stewardship, by convening stakeholders on the local and regional level, ***providing scientific basis for management decisions***, and working with decisionmakers to identify problems and solutions.

3. Bring quality, long-term, local datasets to state and regional decisionmakers

MassDEP

Massachusetts Department of Environmental Protection

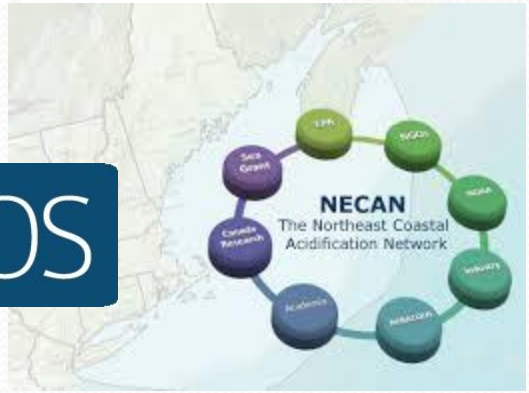
MarineFisheries
Commonwealth of Massachusetts

EPA
United States Environmental Protection Agency

MASSACHUSETTS OFFICE OF
COASTAL ZONE MANAGEMENT

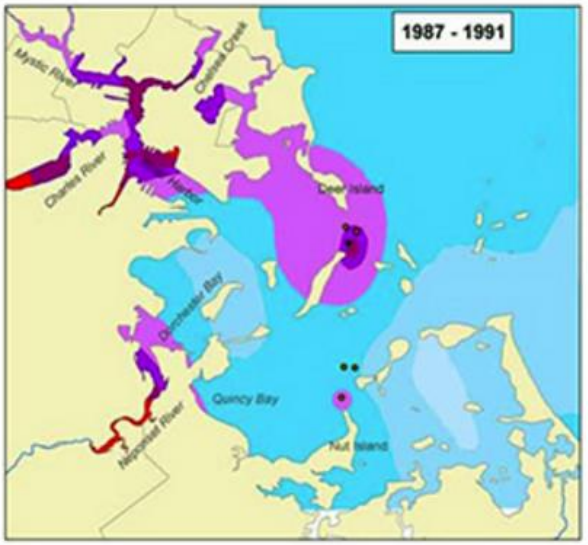
MASSACHUSETTS DEPARTMENT OF FISH AND GAME
Division of Ecological Restoration

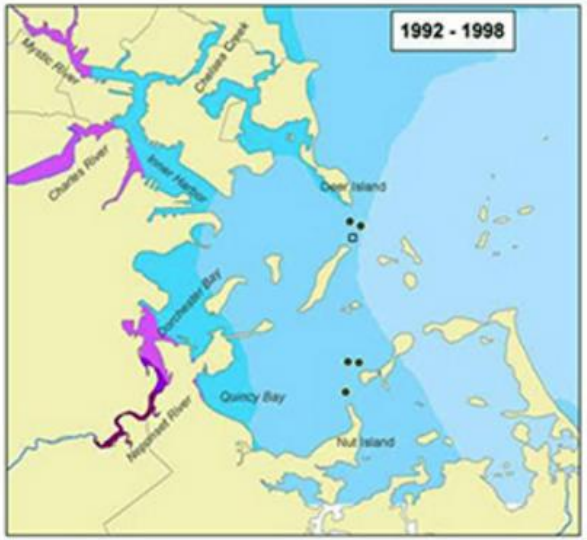
NERACOOS



NROC
Northeast Regional Ocean Council

4. Prompt environmental results!





Source: MWRA, 2008

Summit Agenda & Goals

Working toward common goals

- Support monitoring programs that meet your goals, and answer your own questions.
- Make connections among local and regional monitoring efforts.
- Identify resources we have available to us as a community.
- Identify needs and opportunities for capacity-building.
- Consider forming a Citizen Monitoring Coordinators' Network.

Summit agenda

- Setting the context (all done!)
- Professional development panels
- Trying out a new tool, sparking ideas
- Breakout conversations to explore existing resources and needs
- Feedback, to-do lists